

## Predator Removal in the Primary Channel, Alternative Techniques for Reducing Potential for Predation

### Investigators

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### Summary

The Tracy Fish Collection Facility (TFCF) was constructed in the 1950s to salvage fish drawn into the Tracy Pumping Plant. The TFCF is a louver-type facility originally designed to salvage small striped bass (*Mugil cephalus*) and Chinook salmon (*Oncorhynchus tshawytscha*). Water flowing into the facility first enters through a trashrack at the upstream side where large debris is removed. Downstream of this is a large set of primary louvers, and following this a set of secondary louvers. It has long been known large predators, particularly striped bass, can maintain position in the area between the primary and secondary louvers, and between the louvers and trashrack (Liston *et al.* 1994). It has proven difficult to estimate predator populations, and since predator populations are unknown, no estimate exists as to the total impact exerted on fishes being entrained at the TFCF. Sampling, using nets, has shown the population of potential predators in the facility can be large (Bark unpublished data, Liston *et al.* 1994). Short of dewatering the system, there is currently no way to easily remove predatory species. Several proposals, such as the installation of an electric screen or some similar device to drive predators out have been proposed. However, these devices are untried and would be installed at a relatively high cost. It may be possible to use a much simpler approach under some circumstance to allow predators to exit the facility of their own volition. There are times of the year when entrainment in the facility drops low enough that predator condition can be reduced. It is during these times predators may be likely to leave the facility if presented with the opportunity to do so. It could also be, that given the opportunity to exit, a predator will do so.

### Problem Statement

Predatory fish enter the facility where they apparently reside on an extended basis. Narrow gaps in the trashrack may effectively prevent larger predators from exiting the facility once they have entered it. They can move freely when louvers are moved for cleaning. Populations of predators may be high enough to impact facility efficiency. Several techniques have been proposed to remove predators from the facility though most involve significant engineering works and entail large costs. There are times when the number of fish being entrained at the facility is low, and this is reflected in a decrease in observed condition of predators. It may be possible to create a pathway allowing predators to exit the facility.

## Goals and Hypothesis

### *Goals:*

1. Determine if simple modifications to the current trashrack will allow predators located upstream of the primaries to leave the facility

### *Hypothesis:*

1. If predators will leave the facility when given the opportunity to do so, then removing one or more bars from the trashrack will allow them to exit the facility.
2. If predators are actively trying to enter the facility, then creating an opening in the rack will result in a net movement of fish into the louver system.

## Materials and Methods

For the purposes of determining the effectiveness of removing one or two bars from the trashracks as a predator escapement path, I plan to use a combination of DIDSON camera observations and hydroacoustics. The study would be set up to run at a time when predators are most stressed, and we hope, most likely to leave the facility given the opportunity to do so. A preliminary study trip will be used to determine whether the DIDSON or an acoustic unit will be the most appropriate for monitoring the opening. The noise thresholds may allow one unit to operate more efficiently than the other. Once bars are removed the camera or sonar unit will be placed in an orientation to allow for observation of the opening.

Upon setup, the unit will be run continuously for the entire sampling period. While both DIDSON and more typical acoustic equipment generate large amounts of data, recent software advances allow us to quickly analyze these data. The same software package can now be utilized to analyze long-term data sets from either unit. During sampling events, I propose to operate the system continuously while out there on other projects, or for a period of 1 week each sampling event, the unit will collect data continuously since we have no real apriori expectations of when fish might be likely to enter or leave the facility. If fish densities are observed to be low, the unit can be run on a continuous basis and the data selectively culled. Acoustic data will be analyzed using Echoview and/or through a visual observation of DIDSON data. Data will be presented as numbers of fish moving through the rack over time, directionality of movement, and size of fish observed. Since this experiment is somewhat exploratory in nature, data will be correlated against facility catch, tidal phase, diurnal period, and season to determine if there might be certain times that are more amenable to fish movement than others.

## Coordination and Collaboration

This study will be coordinated with TFCF staff, the Fisheries and Wildlife Resources Group and the Ecological Research and Investigations Group. Prior to any work commencing, we will need to get permission from Tracy Office O&M personnel to have a hole cut in the trashrack. Consultation with Brent Mefford will be used to get input on what it would take to make a hole in the trashrack. Personnel at the facility will be used to aid in modifying the racks. Permission to complete this study will be obtained or denied prior to the end of FY 2009 (September 30, 2009).

## Endangered Species Concerns

This study will not involve handling or capture of endangered or threatened species. It is anticipated no collecting permits will be required for the completion of this study as no physical handling of, or capture of fish is expected to occur.

## Dissemination of Results

The primary deliverables will be articles published in the Tracy report series and if funding is available a peer-reviewed scientific journal. It is anticipated a poster and/or technical presentation and updates will be provided at TTAT, CVFFRT, and CHTR as well as at local scientific and agency meetings in the area. This knowledge will be useful in helping to guide future improvements in collection at fish facilities.

## Literature Cited

- Fausch, K. 2000. *Reducing predation mortality at the Tracy Fish Test Facility: Review and analysis of potential solutions*. Tracy Fish Collection Facility Studies, Volume 12. U.S. Bureau of Reclamation, Mid-Pacific Region, Denver Technical Service Center, and Colorado State University.
- Liston, C., C. Karp, L. Hess, and S. Hiebert. 1994. *Predator removal activities and intake channel studies, 1991–1992*. Tracy Fish Collection Facility Studies, Volume 1. U.S. Bureau of Reclamation, Mid-Pacific Region and Denver Technical Service Center.